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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/055,201	04/03/1998	WILLIAM BROWN	933.P1/MXP/R	3603

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APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

ZERVIGON, RUDY

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 12/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/055,201

Applicant(s)

BROWN ET AL.

Examiner

Rudy Zervigon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 14, 15, 24, 26-38, 40-73 and 75-78 is/are rejected.
- 7) ☒ Claim(s) 39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 April 1998 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 26 October 1999 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☒ Interview Summary (PTO-413) Paper No(s). 31.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn. The amendment filed September 18, 2002 is entered.
2. The indicated allowability of claims 10, 11, 14, 15, 24, 26-30, 33-73, and 75-78 are withdrawn in view of newly discovered art to Maeba et al (USPat. 4,816,046). Rejections based on the newly cited references follow.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the exhaust tube's "distributor plate" must be shown or the feature canceled from the claims. No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claim 39 is objected to because of the following informalities: Claim 39 depends from a deleted claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 9 rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The exhaust tube's "distributor plate" is not described in the specification to enable one of ordinary skill in the art to make and/or use the invention.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 39 depends from a cancelled claim.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1, 6, 24, 31, 35, 56, 59-61, 74, and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ole D. Krogh (USPat. 5,453,125) in view of Foster et al (USPat.

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5,567,243). Krogh teaches a process chamber (16, Figure 2; column 7, lines 22-51) for processing a substrate (17, Figure 2; column 7, lines 22-51) in a process gas (column 7, line 40-45) and reducing emissions of hazardous gas to the environment (column 3, line 38 – column 4, line 36), the process chamber comprising:

- i. A support capable of supporting the substrate (17, Figure 2)
- ii. A gas distributor (18) capable of introducing process gas into the process chamber
- iii. An exhaust tube (7) through which the effluent may be flowed
- iv. The exhaust tube comprises sapphire (Al_2O_3 column 5, lines 39-45) and the exhaust tube, of sufficient length, and being adapted to provide a non-circuitous and non-turbulent flow of effluent there through by being substantially absent projections or recesses (Figure 1) that either alter the flow direction of the effluent to provide a circuitous flow of effluent through the exhaust tube or that cause turbulence in the flow of the effluent through the exhaust tube
- v. A microwave energy applicator (column 6, lines 24-27) to couple microwaves to the effluent flow, by a waveguide (column 4, lines 65-67), through the exhaust tube to reduce the hazardous gas content of the effluent (column 6, lines 9-28)
- vi. The exhaust tube comprises a cylinder (7 or 8) having an axis parallel to the direction of the flow of the effluent through the exhaust tube
- vii. A reagent gas mixer (not shown) capable of mixing a reagent gas with the effluent (column 6, lines 21-24)

Krogh does not teach a process chamber with a gas activator capable of activating the process gas to perform a process in the process chamber.

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Foster teaches a process chamber (5, Figure 1) for processing a substrate (22) in a process gas (column 8, lines 33-65; column 10, lines 34-50). Foster further teaches a support (20) capable of supporting the substrate, a gas distributor (30) capable of introducing process gas into the process chamber, and a gas activator (24) capable of activating the process gas (column 8, lines 33-55) to perform a process in the process chamber.

Foster also teaches, in a second embodiment, a process chamber (40, Figure 2) for processing a substrate (48) in a process gas (column 13, lines 23-30). Foster further teaches a support (46) capable of supporting the substrate, a gas distributor (52) capable of introducing process gas into the process chamber, and an RF gas activator (57) capable of activating the process gas (column 14, lines 18-28) to perform a process in the process chamber.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Krogh to replace his process chamber with Foster's process chamber.

The motivation for replacing the generic processing chamber of Krogh with Foster's process chamber is to supply a specific processing chamber for the required but generically described process chamber of Krogh.

11. Claims 10, 11, 15, 26, 27, 28, 29, 30, 33, 40, 43-46, 49-54, 66, 69-71, 75, 76, and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki (USPat. 5,352,902) in view of Ole D. Krogh (USPat. 5,453,125). Aoki teaches a plasma processing apparatus (1, Figure 4; column 4, line 57- end) including an exhaust tube ("discharge port", as part of optical system 3; Figure 4). Aoki further teaches:

- i. A support capable of supporting the substrate (boat 14, Figure 2; column 3, lines 5-10)
- ii. A gas distributor (20) capable of introducing process gas into the process chamber

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- iii. An exhaust tube (2) through which the effluent may be flowed
- iv. A process chamber (1) with a gas activator (16, 17) capable of activating the process gas to perform a process in the process chamber (column 3, lines 5-41).
- v. a gas analyzer (3, Figure 4; column 4, line 64 - column 5, line 50) capable of monitoring the gas content of the effluent and providing a signal ("electrical signals"; column 4, line 64 - column 5, line 50) in relation to the gas content of the effluent; and
- vi. a computer controller (5B, Figure 4; column 5, lines 50-60; column 7, lines 18-29) system comprising a computer readable medium having computer readable program code embodied therein (5, Figure 4; column 5, lines 33-41), the computer controller (5B, Figure 4; column 5, lines 50-60; column 7, lines 18-29) system capable of monitoring the signal ("electrical signals"; column 4, line 64 - column 5, line 50) from the gas analyzer (3, Figure 4; column 4, line 64 - column 5, line 50; column 7, lines 4-17), and when the gas content of the effluent exceeds a level (column 7, lines 25-29), performing at least one of the following:
 - vii. adjusting a power (column 5, lines 55-60) applied to an energy applicator (16, 17; "RF") to influence the hazardous gas content in the effluent,
 - viii. adjusting process conditions (20A; 20B; 16; 17; Figure 4; column 5, lines 51-60) in the process chamber to influence the hazardous gas content in the effluent,
 - ix. activating an alarm ("Step I-8"; Figure 6) or metering display
 - x. terminating the process (column 8, lines 53-65)

Aoki does not teach a microwave energy applicator to couple microwaves to the effluent flowing through the exhaust tube to reduce the hazardous gas content of the effluent.

Ole D. Krogh is discussed above.

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It would have been obvious to one of ordinary skill in the art at the time the invention was made for Aoki to use and control Ole D. Krogh's a microwave energy applicator to couple microwaves to the effluent flowing through the exhaust tube to reduce the hazardous gas content of the effluent.

Motivation for Aoki to use and control Ole D. Krogh's a microwave energy applicator to couple microwaves to the effluent flowing through the exhaust tube to reduce the hazardous gas content of the effluent is to reduce human toxicity of the effluent gas as taught by Krogh (column 3, lines 38-55).

12. Claims 11, 15, 26, 27, 28, 29, 30, 33, 37, 38, 50-54, 64-66, 69-71, 76, and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ole D. Krogh (USPat. 5,453,125) and Foster et al (USPat. 5,567,243), in view of Aoki (USPat. 5,352,902). Aoki, Ole D. Krogh, and Foster et al are discussed above. However, Ole D. Krogh and Foster et al do not teach:

- i. a gas analyzer capable of monitoring the gas content of the effluent and providing a signal in relation to the gas content of the effluent; and
- ii. a computer controller system comprising a computer readable medium having computer readable program code embodied therein, the computer controller system capable of monitoring the signal from the gas analyzer, and when the gas content of the effluent exceeds a level, performing at least one of the following:
- iii. adjusting a power applied to an energy applicator to influence the hazardous gas content in the effluent,
- iv. adjusting process conditions in the process chamber to influence the hazardous gas content in the effluent,

- v. activating an alarm or metering display

Aoki further teaches:

- vi. a gas analyzer (3, Figure 4; column 4, line 64 - column 5, line 50) capable of monitoring the gas content of the effluent and providing a signal ("electrical signals"; column 4, line 64 - column 5, line 50) in relation to the gas content of the effluent; and
- vii. a computer controller (5B, Figure 4; column 5, lines 50-60; column 7, lines 18-29) system comprising a computer readable medium having computer readable program code embodied therein (5, Figure 4; column 5, lines 33-41), the computer controller (5B, Figure 4; column 5, lines 50-60; column 7, lines 18-29) system capable of monitoring the signal ("electrical signals"; column 4, line 64 - column 5, line 50) from the gas analyzer (3, Figure 4; column 4, line 64 - column 5, line 50; column 7, lines 4-17), and when the gas content of the effluent exceeds a level (column 7, lines 25-29), performing at least one of the following:
- viii. adjusting a power (column 5, lines 55-60) applied to an energy applicator (16, 17; "RF") to influence the hazardous gas content in the effluent,
- ix. adjusting process conditions (20A; 20B; 16; 17; Figure 4; column 5, lines 51-60) in the process chamber to influence the hazardous gas content in the effluent,
- x. activating an alarm ("Step I-8"; Figure 6) or metering display
- xi. terminating the process (column 8, lines 53-65)

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Ole D. Krogh and Foster to use Aoki's computer controller system.

Motivation for Ole D. Krogh and Foster to use Aoki's computer controller system is for automation and control of the plasma process (column 2, lines 13-34). It is further provided that

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computer automation of the plasma processes provides optimization of the processes. (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); MPEP 2144.05).

13. Claims 2-5, and 57-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ole D. Krogh (USPat. 5,453,125) in view of Foster et al (USPat. 5,567,243). Ole D. Krogh and Foster are discussed above. However, Krogh and Foster do not teach an exhaust tube comprising a length that is sufficiently long to provide a residence time of the effluent that is at least about 0.01 seconds. Krogh and Foster do not teach laminar flow through the exhaust tube.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Krogh to vary the length of the exhaust tube to provide a residence time of the effluent that is at least about 0.01 seconds.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Krogh and Foster to provide a laminar flow through the exhaust tube by varying the flow rate of the effluent and/or reactant gas.

Motivation for Krogh and Foster to vary the length of the exhaust tube to provide a residence time of the effluent that is at least about 0.01 seconds and to provide a laminar flow is to optimize the destruction of the effluent gas (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); MPEP 2144.05).

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Furthermore, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art. (Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04).

14. Claims 41-43, 51, and 67-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki (USPat. 5,352,902) and Ole D. Krogh (USPat. 5,453,125), as applied to claims 10, 11, and 26. However, Aoki and Krogh do not teach an exhaust tube comprising a length that is sufficiently long to provide a residence time of the effluent that is at least about 0.01 seconds. Aoki and Krogh do not teach laminar flow through the exhaust tube.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Aoki and Krogh to vary the length of the exhaust tube to provide a residence time of the effluent that is at least about 0.01 seconds.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Aoki and Krogh to provide a laminar flow through the exhaust tube by varying the flow rate of the effluent and/or reactant gas.

Motivation for Aoki and Krogh to vary the length of the exhaust tube to provide a residence time of the effluent that is at least about 0.01 seconds and to provide a laminar flow is to optimize the destruction of the effluent gas (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); MPEP 2144.05).

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Furthermore, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art. (Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04).

15. Claims 8, 32, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ole D. Krogh (USPat. 5,453,125) and Foster et al (USPat. 5,567,243), as applied to claims 1 and 24 above, and further in view of Maeba et al (USPat. 4,816,046). Krogh and Foster do not teach an RF energy applicator to couple RF energy to the effluent. Maeba teaches plasma CVD effluent gas treatment (column 3, lines 45-60; column 4, lines 58-65). Maeba teaches an RF energy applicator (34/35; Figure 10) to couple RF energy to the effluent (23). ~~However, Maeba does not teach a gas distributor, a gas activator, or a substrate support.~~

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It would have been obvious to one of ordinary skill in the art at the time the invention was made for Krogh and Foster to add Maeba's RF energy applicator to couple RF energy to the effluent. Motivation for Krogh and Foster to add Maeba's RF energy applicator to couple RF energy to the effluent is for limiting process gas condensation leading to clogging of the vacuum pump (column 5, lines 3-10).

16. Claims 14, 34, 36, 48, and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki (USPat. 5,352,902), Ole D. Krogh (USPat. 5,453,125), as applied to claims 10, 11 and 26 above, and further in view of Maeba et al (USPat. 4,816,046). Aoki, and Krogh do not teach an RF energy applicator to couple RF energy to the effluent. Maeba teaches plasma CVD effluent gas treatment (column 3, lines 45-60; column 4, lines 58-65). Maeba teaches an RF

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energy applicator (34/35; Figure 10) to couple RF energy to the effluent (23). ~~However, Maeba does not teach a gas distributor, a gas activator, or a substrate support.~~

11/23/02

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Aoki and Krogh to add Maeba's RF energy applicator to couple RF energy to the effluent.

Motivation for Aoki and Krogh to add Maeba's RF energy applicator to couple RF energy to the effluent is for limiting process gas condensation leading to clogging of the vacuum pump (column 5, lines 3-10).

17. Claims 47, 55, and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki (USPat. 5,352,902) in view of Ole D. Krogh (USPat. 5,453,125). Aoki and Ole D. Krogh are discussed above. However, Krogh only teaches sapphire comprising the exhaust tube. As a result, Krogh does not teach monocrystalline sapphire comprising the exhaust tube.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Aoki and Ole D. Krogh to replace the sapphire comprising the exhaust tube with monocrystalline sapphire.

The replacement of the sapphire comprising the exhaust tube with monocrystalline sapphire is an equivalent replacement.

18. Claim 62 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ole D. Krogh (USPat. 5,453,125) in view of Foster et al (USPat. 5,567,243). Ole D. Krogh and Foster are discussed above. However, Krogh only teaches sapphire comprising the exhaust tube. As a result, Krogh does not teach monocrystalline sapphire comprising the exhaust tube.

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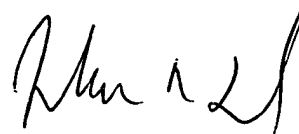
It would have been obvious to one of ordinary skill in the art at the time the invention was made for Ole D. Krogh and Foster to replace the sapphire comprising the exhaust tube with monocrystalline sapphire.

The replacement of the sapphire comprising the exhaust tube with monocrystalline sapphire is an equivalent replacement.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. USPat. 4,608,063; 5,928,426; 5,422,081; 4,940,213; 4,793,283.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 872-9311. The official before final fax phone number for the 1763 art unit is (703) 872-9310. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.



**JEFFRIE R. LUND
PRIMARY EXAMINER**